



Work Instruction

DIRECTIVE NO. 270-WI-8072.0.1A

EFFECTIVE DATE: 02/03/2016

EXPIRATION DATE: 02/03/2021

APPROVED BY Signature: Original Signed By

NAME: Naomi Manadier

TITLE: Acting Chief, Information and Logistics
Management Division

COMPLIANCE IS MANDATORY

Responsible Office: Code 270/Information and Logistics Management Division

Title: Procedure for Prohibited Materials Analysis Using the XDAL XRF Machine

PREFACE

P.1 PURPOSE

The purpose of this document is to describe the procedure for safe operation of the Fischer XDAL to detect and identify prohibited materials in electronic devices purchased and received by the Information and Logistics Management Division (ILMD). This system is currently located in Building 35, Room 375 of the Code 279 electrical, electronic, and electromechanical (EEE) parts labs.

P.2 APPLICABILITY

These procedures are applicable to all EEE parts purchased and received by ILMD personnel at the NASA Goddard Space Flight Center Greenbelt facility unless the parts requestor has indicated on the EEE Parts Requisition, that XRF (X-Ray Fluorescence) screening is not required for the parts.

P.3 REFERENCES

- a. MIL-STD-1580 - Department Of Defense Test Method Standard: Destructive Physical Analysis (DPA) for Electronic, Electromagnetic, and Electromechanical
- b. GPR 1860.1 Goddard Procedural Requirement: Ionizing Radiation Protection
- c. Fischer XDAL Operator's Manual

P.4 CANCELLATION

270-WI-8072.0.1

P.5 TOOLS, EQUIPMENT, AND MATERIALS

Refer to the Instructions section of this document for information on tools, equipment, and materials.

CHECK THE GSFC DIRECTIVES MANAGEMENT SYSTEM AT
<http://gdms.gsfc.nasa.gov> TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

P.6 SAFETY PRECAUTIONS AND WARNINGS

X-RAY Radiation

Operating personnel and the area surrounding the instrument are protected from X-Ray Radiation because the beam is enclosed and there are integrated protection devices.

Electrical Shock

Components carrying high voltages are located on the inside of the instrument. Improperly performed maintenance and repair work can result in the risk of injury to personnel, can damage the instrument and can cause danger to the surrounding area.

Electrostatic Sensitive Devices (ESD)

Use of the Fisher XDAL equipment occurs in an ESD lab and therefore, all necessary ESD precautions are required. Only ESD trained and certified personnel shall handle ESD parts.

P.7 TRAINING

All personnel authorized to use the XDAL shall receive training from the Equipment Owner/ Custodian and Goddard Radiation Safety training prior to use. In addition, users shall receive additional information from the operating manual regarding safety issues unique to this specialized equipment, and software usage notes as provided by Equipment Owner for training purposes. Users are required to complete a 40-hour On-The-Job Training (OJT) program.

P.8 RECORDS

Record Title	Record Custodian	Retention
GSFC Form 20-2, Receiving Inspection & Test Form (RITF)	Code 279 Lab Supervisor or Lab Operations Manager	* NRRS 8/101 - Cut off records at close of program/project or in 3-year blocks for long term programs/projects. Transfer to national archives 7years after cutoff.
Data or Results	Code 279 Lab Supervisor or Lab Operations Manager	* NRRS 8/103 - Destroy/delete between 5 and 30 years after program/project termination. Maintain with corresponding Inspection Data Files

** NRRS 1441.1 – NASA Records Retention Schedule*

CHECK THE GSFC DIRECTIVES MANAGEMENT SYSTEM AT
<http://gdms.gsfc.nasa.gov> TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

P.9 MEASUREMENT/ VERIFICATION

N/A

INSTRUCTIONS

In this document, a requirement is identified by “shall,” a good practice by “should,” permission by “may” or “can,” expectation by “will,” and descriptive material by “is.”

1. RESPONSIBILITIES

Supply Branch Manager is responsible for the oversight of the entire EEE parts receiving and inspection process.

Project Parts Warehouse Supervisor is responsible for ensuring that only trained personnel operate this equipment and that the equipment, is properly checked and certified by the Radiation Safety Office as required, and that the equipment is maintained in accordance with the procedures of this work instruction and the recommendations of the equipment owner’s manual.

XRF machine users are responsible for following the procedures outlined in this work instruction.

2.0 PROCEDURES

Turning the Instrument On




1. Turn on black ON/OFF switch located towards the back, on the right side of the instrument
2. Turn on the computer and monitor
3. Log in to Windows using your username and password
4. Wait for the stage to finish positioning itself
5. Lift the acrylic door
6. Use the key to turn on High Voltage (the key is in a box in the drawer to your right)

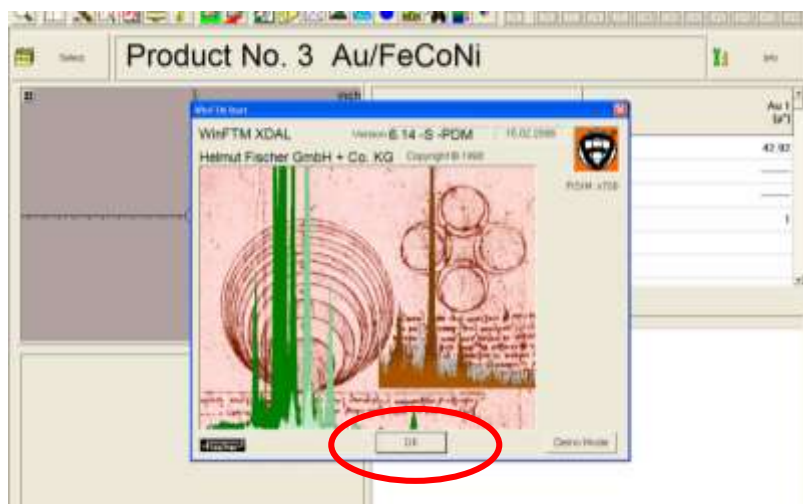
CHECK THE GSFC DIRECTIVES MANAGEMENT SYSTEM AT

<http://gdms.gsfc.nasa.gov> TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

DIRECTIVE NO. 270-WI-8072.0.1A
EFFECTIVE DATE: 02/03/2016
EXPIRATION DATE: 02/03/2021

Page 4 of 15

7. Close the acrylic door
8. Double click this icon on the desktop:  to start the software
9. When you see the WinFTM Start box, Click OK as seen below.



10. Verify that the weekly reference measurements and standards have been run by checking the log near the tool.

Sample Plan

Uniform sampling plan shall be used identical to S311-M70 plan that depends on lot size:

For lots <200 pieces:

Small Lot Sample Plan

Quantity Procured	Sample Size
< 5	1
5 -- 15	2
16 -- 50	3
51 -- 199	5

For lots 200 pieces and greater shall be per MIL-STD-1580, paragraph 4.1.1:

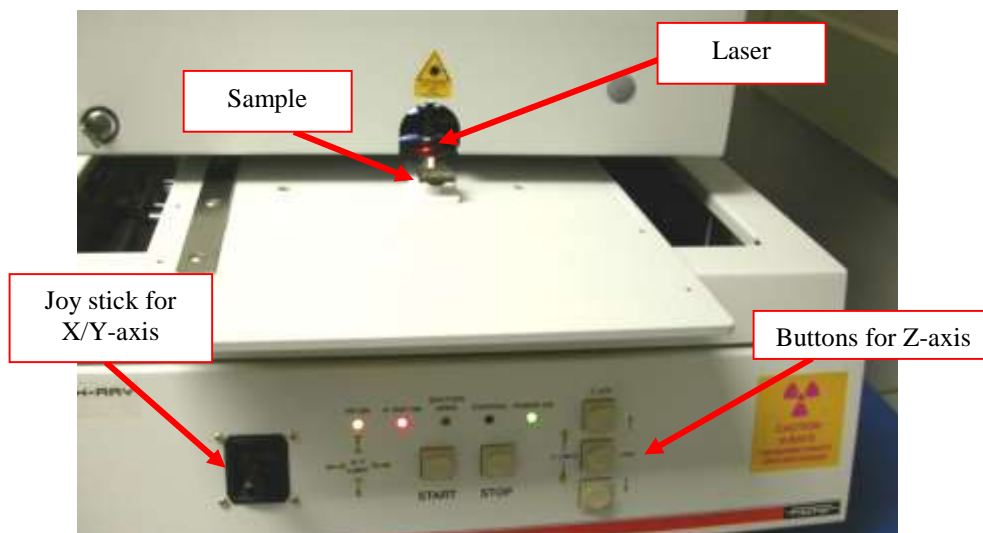
When a sample is conducted to verify lot conformance, the minimum sample size shall be two (2) percent or five (5) units, whichever is greater, to a maximum of 30 units per Lot Date Code and Part Number combination. Further consideration should be made of increasing the sample size to random

CHECK THE GSFC DIRECTIVES MANAGEMENT SYSTEM AT
<http://gdms.gsfc.nasa.gov> TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

representative sampling for non-homogeneous lots, lots manufactured on non-QPL/QML lines [Qualified Manufacturers List (QML)/Qualified Product List (QPL)], or lower quality level parts. In case of high cost parts, parts with very limited availability, or parts manufactured on a controlled QPL/QML product line the sample size may be reduced with the approval of Parts, Materiel, and Processes Control Board (PMPCB) or as defined by project or program requirements.

Loading a Sample

1. Lift the acrylic door, and the stage will slide out.
2. Adjust the clearance on the stage, according to sample height, by moving the Z-axis up or down (the fast button increases speed, press the fast button while pressing the ↑ or ↓ button).
3. See the RITF or Receipt Traveler for the specific area(s) of interest to be inspected. Identify number of samples to test per requirements contained in this work instruction.
4. Place the sample on the stage so the area of interest is directly under the red laser



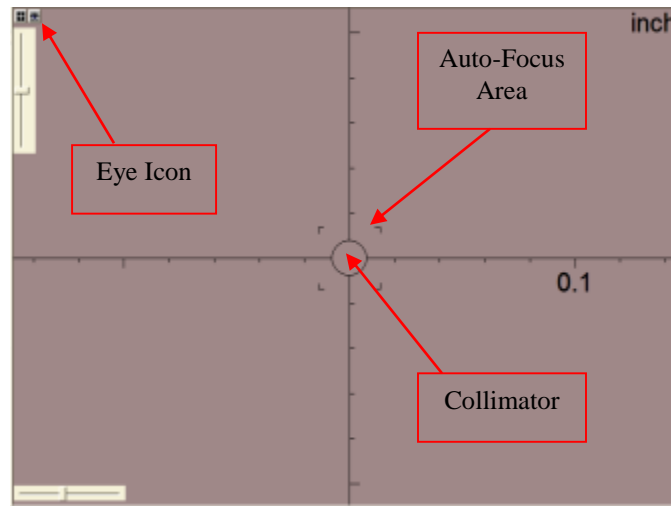
5. Parts should be placed so that the area of interest is horizontal/flat. If necessary, place parts on a holder.
6. Lower the door. The stage positions the sample under the camera.



Focusing the Camera

1. Click the magnifying glass icon  to enlarge the camera image.

CHECK THE GSFC DIRECTIVES MANAGEMENT SYSTEM AT
<http://gdms.gsfc.nasa.gov> TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

2. Use one of the following ways of focusing the camera:
 - a. Use Z-axis buttons on the tool
 - b. Click the eye icon to auto-focus on the area in the square (auto-focus only works if the object fits in the auto-focus area):






3. Use one of the following ways to center the collimator on your area of interest:
 - a. Use the joystick on the tool
 - b. Use the mouse to click on a location in the camera image
 - c. Right click and hold in a direction to drive the camera around (the further away you are from the center of the crosshairs, the faster the camera will move)
4. Click the magnifying glass icon  to minimize the camera image
5. Check the collimator size. Use the largest possible collimator that will still completely cover your area of interest. Smaller collimator sizes require longer measurement time. If you need to change the collimator size:
 - a. Click "Info" button:
 - b. Choose "Application" tab
 - c. Click "Collim." button and choose the best one.
 - d. Click OK.
 - e. A message appears, Click OK again
 - f. Re-normalize by clicking the blue circle icon: 
 - g. A message appears, Click Yes.

Acquiring Spectrum

1. Click "display spectrum" icon: 

CHECK THE GSFC DIRECTIVES MANAGEMENT SYSTEM AT
<http://gdms.gsfc.nasa.gov> TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

2. Click the “green man” button in lower left corner of screen. Let the program run until the material spectrum appears to stop changing; approximately two minutes.
3. Click the “red man” button in lower left corner to stop the acquisition.
4. Click “pink Z” icon  to auto-identify elements in the spectrum.
5. Click “periodic table” icon  to add or remove elements (click on the elements). Elements with atomic numbers lower than 22 (Titanium) are not visible to the XRF and should not be selected from the table.
6. Return to the home screen by clicking the “yellow door” icon .

NOTE: Accept/Reject criteria are as follows, or as specified in the RITF.

7. The sample shall match the requirements as specified by the procurement documentation for the part (s). If the sample does not match the expected spectrum, the part FAILS the prohibited materials analysis. Copy and paste spectrum into Word document and save by project to SharePoint/EEE/Project Parts Scanned Documents/XRF Screening/...
8. If the sample does not contain Zinc (Zn), Cadmium (Cd), Selenium (Se), or Tin (Sn), the part PASSES prohibited materials analysis. Copy and paste spectrum into Word document and save by project to SharePoint/EEE/Project Parts Scanned Documents/XRF Screening/...
9. If the sample contains Cd or Se, the part FAILS prohibited materials analysis. Copy and paste spectrum into Word document and save by project to SharePoint/EEE/Project Parts Scanned Documents/XRF Screening/...
10. If the sample contains Zn, it must be part of a brass alloy (Cu and Zn). Pure Zn is not allowed as a surface finish. To verify this composition, proceed to the following steps for **Loading a Product**.
11. If the sample contains Sn, it shall contain a minimum of 3% Lead (Pb), alloyed with the Sn. Pure Sn is not allowed as a surface finish. To verify this composition, proceed to the following steps for **Loading a Product**.
12. If the sample contains Sn, but no Pb in any amount (i.e. Pb-free solder alloy), the sample FAILS prohibited materials analysis. Proceed to the steps for **Loading a Product**.

Loading a Product

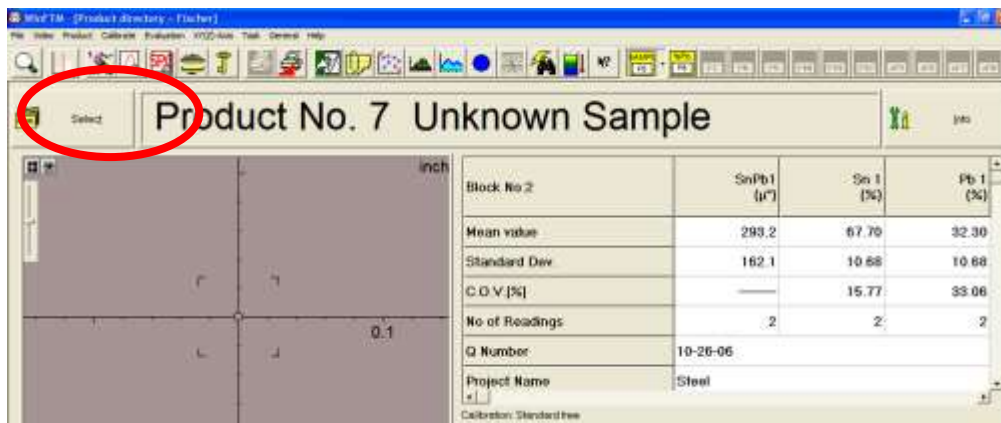
1. Choose the product that matches with the elements and composition of the layers using the following rules:

CHECK THE GSFC DIRECTIVES MANAGEMENT SYSTEM AT
<http://gdms.gsfc.nasa.gov> TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

DIRECTIVE NO. 270-WI-8072.0.1A
EFFECTIVE DATE: 02/03/2016
EXPIRATION DATE: 02/03/2021

Page 8 of 15

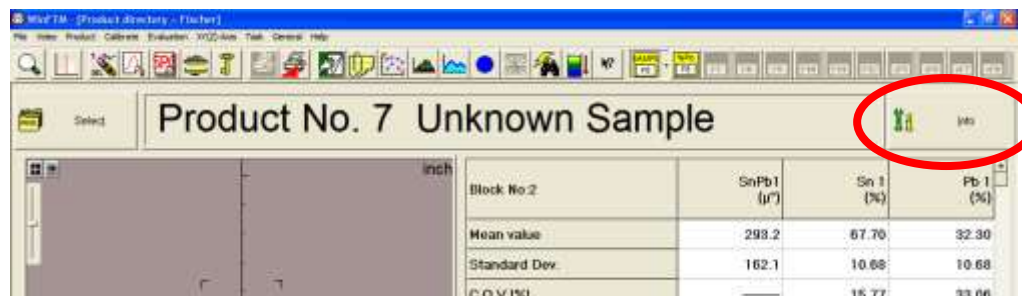
- a. Coatings and platings are listed from top layer down, with the base material listed last
 - b. Layers are separated with a forward slash
 - c. Example: SnPb/Cu indicates a layer of Tin and Lead combined as in a solder, *on top of* a base layer of pure Copper. ZnCu indicates a single layer alloy of Zinc and Copper as in brass.
2. Click the “Select” button, to select the appropriate product.
If a Product does not exist that matches the apparent material composition acquired by the spectrum, stop and notify the equipment owner or designee.



3. Click OK
4. Choose the “Evaluation” menu → Select “Delete all meas. Data”
5. Click OK
6. Verify your measurement parameters (measurement time, collimator size, report printform, etc.) by following the instructions in: **Changing Measurement Parameters**.

Changing Measurement Parameters


1. Return to the home screen, and click “Info” button to get the Modify Product page.




2. Choose “Application” tab at the top of the Modify Product window
Here the collimator size/shape can be changed. Click “Collim.” button and choose the size most suited for the sample; i.e. Use the largest possible collimator size.

CHECK THE GSFC DIRECTIVES MANAGEMENT SYSTEM AT

<http://gdms.gsfc.nasa.gov> TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

3. Choose “Product” tab at the top of the Modify Product window.
Here, the parameters such as measurement time and number of measurements can be changed.
Smaller collimator sizes require longer measurement time (60 seconds for the smallest, 45 seconds for the largest). Number of measurements should be 1.
4. Click OK to all messages that pop up.
5. If collimator was changed, re-normalize by clicking the blue circle icon: 
6. A Message appears, Click Yes.
7. Go to “Running a Product”.

Running a Product

1. The appropriate product should be loaded, and measurement parameters verified. Select testing points on part.
2. Click the “Start” button in the lower left corner 
3. If you get an error message after running the product, then the wrong product may have been selected. Notify lead operator for assistance.
4. For the quality of your measurement, make sure the mq is small (less than 3).

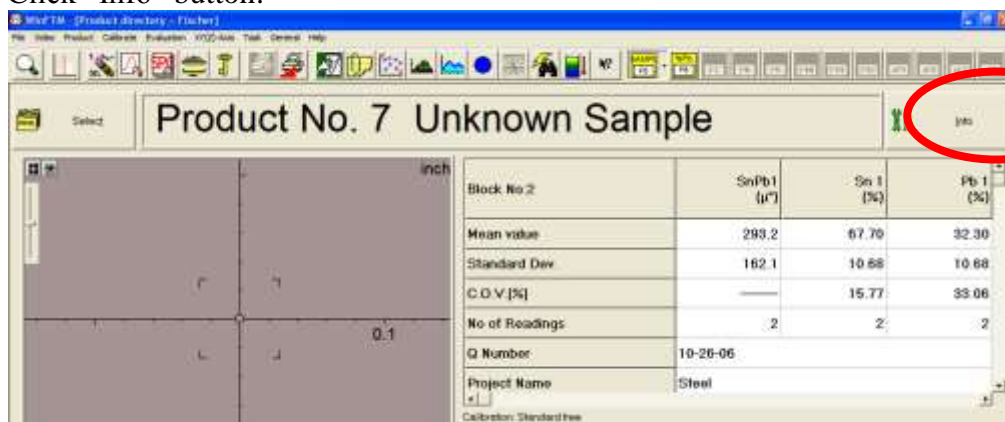


5. Go to “Creating a Report”.


Creating a Report

1. Verify that the correct GSFC PALab approved print form is loaded.

- a. Click “Info” button:



- b. Choose “Product” tab at the top of the Modify Product window
- c. The box next to the “Printform Group” button should say “GoddardC_BLOCK_FiRep...” If it doesn’t say this, click the “Printform Group” button and select the Goddard printform and click OK.
- d. Click OK again.

2. Click the “block report” icon  to generate a report.

3. For editing or inserting into lab reports, copy and paste spectrum into Word document and save by project to SharePoint/EEE/Project Parts Scanned Documents/XRF Screening/...
4. Document XRF results on the RITF

Turning the Instrument Off

1. Exit the XDAL software on the computer
2. Use key to turn High Voltage off.
3. Remove key and store in box in drawer on the right.
4. Remove sample by lifting the glass door and letting the stage come out. Do not remove sample until stage has stopped moving.
5. Turn off the black ON/OFF switch on right side, towards the back of the instrument.

CHECK THE GSFC DIRECTIVES MANAGEMENT SYSTEM AT
<http://gdms.gsfc.nasa.gov> TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

6. Perform a Windows XP shutdown. Note, this step does not need to be performed after every test, only when machine will be inactive for a long period of time (over a long holiday weekend for example).

NOTE: The following steps do not need to be done every time you use the machine. They are to be done periodically as stated.

Reference Measurement (once a week)

1. From the home screen, choose the “General” menu → Select “Reference Measurement”
2. Load the plate of pure elements into the machine (located in a black box in the bench drawer on the right)
3. Center the collimator over the Ag sample
4. Focus the camera
5. Click “XY-Pos. Ag” button in the reference measurement window
6. Repeat for Cu (center collimator, focus camera, and store position)
7. Click “Start Reference” button, and wait a few minutes for the data to be collected
8. Accept the message that says “Reference OK, Accept?”
9. The software will automatically save a reference in the service folder.

Calibration Standards (once a week)

There are currently four (4) different standards in use with the XRF equipment: “111 μin 90Sn10Pb”, “426 μin SnPb”, “96.2 μin Ni”, “Sat. Cu”. The calibration process shall be performed, every week, using the below specified combinations of material standards. The standards are in an ESD bag in the bench drawer on the right.

Calibration using 111 90Sn10Pb and Sat Cu standards

1. Load the product named SnPb/Cu.
2. Place the 111 μin SnPb standard directly on top of the Sat Cu standard.
3. Load them into the XRF.
4. Center and focus the collimator on the center of the sample.
5. Click the “Start” button.
6. After the reading is complete, create a report.
7. Print the report and save it in the calibration folder.

Calibration using 426 90Sn10Pb and 96.2Ni and Sat Cu standards

1. Load the product named SnPb/Ni/Cu.
2. Place the 426 μin SnPb standard directly on top of the 96.2 μin Ni standard and place both directly on top of the Sat Cu standard
3. Load them into the XRF.
4. Center and focus the collimator on the center of the sample.

CHECK THE GSFC DIRECTIVES MANAGEMENT SYSTEM AT
<http://gdms.gsfc.nasa.gov> TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

DIRECTIVE NO.	<u>270-WI-8072.0.1A</u>
EFFECTIVE DATE:	<u>02/03/2016</u>
EXPIRATION DATE:	<u>02/03/2021</u>

Page 12 of 15

5. Click the “Start” button.
6. After the reading is complete, create a report.
7. Print the report and save it in the calibration folder.

CHECK THE GSFC DIRECTIVES MANAGEMENT SYSTEM AT
<http://gdms.gsfc.nasa.gov> TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

DIRECTIVE NO.	<u>270-WI-8072.0.1A</u>
EFFECTIVE DATE:	<u>02/03/2016</u>
EXPIRATION DATE:	<u>02/03/2021</u>

Page 13 of 15

Appendix A – Definitions

N/A

CHECK THE GSFC DIRECTIVES MANAGEMENT SYSTEM AT
<http://gdms.gsfc.nasa.gov> TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

DIRECTIVE NO.	<u>270-WI-8072.0.1A</u>
EFFECTIVE DATE:	<u>02/03/2016</u>
EXPIRATION DATE:	<u>02/03/2021</u>

Page 14 of 15

Appendix B – Acronyms

EEE - electrical, electronic, and electromechanical

ILMD - Information and Logistics Management Division

OJT - On-The-Job Training

PMPCB – Parts, Materiel and Processes Control Board

QML/QPL - Qualified Manufacturers List (QML)/Qualified Product List (QPL)

RITF – Receiving Inspection & Test Form

XRF - X-Ray Fluorescence

CHECK THE GSFC DIRECTIVES MANAGEMENT SYSTEM AT
<http://gdms.gsfc.nasa.gov> TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

DIRECTIVE NO. 270-WI-8072.0.1A
EFFECTIVE DATE: 02/03/2016
EXPIRATION DATE: 02/03/2021

Page 15 of 15

CHANGE HISTORY LOG

Revision	Effective Date	Description of Changes
Baseline	8/28/2013	Initial Release
A	2/3/2016	<ul style="list-style-type: none">• P3-Changed GPR reference to 1840.1• P8-Changed Work Order Authorization (WOA) to GSFC Form 20-2, Receiving Inspection & Test Form (RITF) and changed retention schedule• 1- Changed responsibility from Deputy to Branch Manager• 2- Acquiring Spectrum Note-Changed WOA to RITF• 2.7, 8 & 9-Changed public drive to SharePoint• Creating a Report Section 3-changed public drive to SharePoint• Appendix B-Changed WOA to RITF

CHECK THE GSFC DIRECTIVES MANAGEMENT SYSTEM AT
<http://gdms.gsfc.nasa.gov> TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.